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10/815,975	04/02/2004	James Vogeley	4209-37	7724

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EXAMINER

DOUGHERTY, THOMAS M

ART UNIT PAPER NUMBER

2834

DATE MAILED: 05/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/815,975	<b>Applicant(s)</b> VOGELEY, JAMES	
	<b>Examiner</b> Thomas M. Dougherty	<b>Art Unit</b> 2834	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 April 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6,9-17,20-23 and 25-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9,10,20,21,25,35 and 36 is/are allowed.
- 6) ☒ Claim(s) 1,2,5,6,11-13,16,17,22,26-28 and 31-34 is/are rejected.
- 7) ☒ Claim(s) 3,4,14,15,23,29 and 30 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>106</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 5, 11, are rejected under 35 U.S.C. 102(b) as being anticipated by Raffalt et al. (US 2002/0140441). Raffalt et al. show (fig. 1) note (claims 1, 4-6) a method for determining a parameter for a piezoelectric actuator (7), the method comprising: applying a drive signal to the piezoelectric actuator (7); operating the piezoelectric actuator (7); obtaining a feedback signal (via 8, see cl. 7) from the piezoelectric actuator (7); using the feedback signal to determine a capacitance of the piezoelectric actuator (7).

The method further comprising subsequently using the capacitance of the piezoelectric actuator to control the drive signal to the piezoelectric actuator.

Raffalt et al. show a drive circuit (fig. 1) for sensing capacitance of a piezoelectric actuator (7) operating in a device (a level sensor, see ABSTRACT) and for adjusting a drive signal of the piezoelectric actuator in accordance with the capacitance.

### ***Claim Rejections - 35 USC § 103***

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 12, 13, 16, 22, 26-28 and 31 are is rejected under 35 U.S.C. 103(a) as being unpatentable over Raffalt et al. (US 2002/0140441) in view of Takagi et al. (US 2004/0018100). Given the invention of Raffalt et al. as noted above, they don't note use of their piezoelectric actuator to pump fluid in a pump.

Takagi et al. show (fig. 8) note (claims 1, 4, 5) a method for determining a parameter for a piezoelectric actuator (6), the method comprising: applying a drive signal to the piezoelectric actuator (6); operating the piezoelectric actuator (6); obtaining a feedback signal (from 28) from the piezoelectric actuator (6); using the feedback signal to determine a parameter (see paragraph [0132]) of the piezoelectric actuator (6).

The step of operating the piezoelectric actuator comprises using the piezoelectric actuator to pump fluid in a pump.

The device is a pump (as labeled) and wherein the piezoelectric actuator (6) operates to pump fluid in the pump. Note in fig. 1 that the inlet is labeled as 1, the pump chamber as 3 and the discharge channel as 2.

The drive circuit (fig. 1) comprises a controller (components of circuit) for controlling a drive signal applied to the piezoelectric actuator; a feedback monitor (via 8) for obtaining a feedback signal from the piezoelectric actuator (7) while the piezoelectric

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actuator operates; a processor (see 22c in fig. 6) for using the feedback signal to determine the parameter of the piezoelectric actuator (6).

The controller (22) subsequently uses the parameter of the piezoelectric actuator (6) to control the drive signal to the piezoelectric actuator (6).

The drive circuit (20) comprises: means for applying a drive signal to the piezoelectric actuator (6); means for obtaining a feedback signal (paragraph [0132]) from the piezoelectric actuator (6) while the piezoelectric actuator (6) operates; means for using the feedback signal to determine a parameter of the piezoelectric actuator.

Takagi et al. show (figs. 1, 6, 8) a piezoelectrically-actuated device comprising: a piezoelectric actuator (6) which is responsive to a drive signal for pumping fluid between the inlet (1) and outlet (2); and a drive circuit (20) for sensing a parameter (paragraph [0132]) of the piezoelectric actuator (6) and for adjusting a drive signal of the piezoelectric actuator (6) in accordance with the parameter.

The device is a pump having a pump body for at least partially defining a pumping chamber (3) having an inlet (1) and an outlet (2) which communicate with the pumping chamber (3), and wherein the piezoelectric actuator (6) pumps fluid between the inlet (1) and outlet (2).

The drive circuit (20) comprises: a controller (22) for applying a drive signal to the piezoelectric actuator (6); a feedback monitor for obtaining a feedback signal (see paragraph [0132]) from the piezoelectric actuator (6) while the piezoelectric actuator (6) operates a processor (22c) for using the feedback signal to determine a parameter of the piezoelectric actuator (6).

The controller (22) subsequently uses the parameter of the piezoelectric actuator (6) to control the drive signal to the piezoelectric actuator (6).

Takagi et al. don't note sensing the capacitance of the piezoelectric actuator.

It would have been obvious to one having ordinary skill in the art to sense a capacitance of the piezoelectric actuator in the device of Takagi et al. at the time of their invention such as is taught by Raffalt et al. since the design of the circuit allows for a method that monitors the entire power circuit of the transducer device for interruptions without requiring additional lines or components on the actuator element itself as Raffalt et al. note in their paragraph 7.

Claims 2, 12, 13, 16, 22, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Raffalt et al. (US 2002/0140441) in view of Aoki (JP 06-117377). Given the invention of Raffalt et al. as noted above, they don't note use of their piezoelectric actuator to pump fluid in a pump.

Aoki shows (figs. 1, 6) a method for determining a parameter for a piezoelectric actuator (22), the method comprising: applying a drive signal to the piezoelectric actuator (6); operating the piezoelectric actuator (6); obtaining a feedback signal (from 22) from the piezoelectric actuator (22); using the feedback signal to determine a parameter (see CONSTITUTION) of the piezoelectric actuator (22).

The step of operating the piezoelectric actuator comprises using the piezoelectric actuator (22) to pump fluid in a pump (10).

The method further comprising subsequently using the parameter of the piezoelectric actuator (22) to control the drive signal to the piezoelectric actuator (22).

Aoki shows (figs. 1, 6) a drive circuit for sensing a parameter of a piezoelectric actuator (22) operating in a device (10) and for adjusting a drive signal of the piezoelectric actuator (22) in accordance with the parameter. See CONSTITUTION.

The drive circuit comprises a controller (31) for controlling a drive signal applied to the piezoelectric actuator (22); a feedback monitor (CONSTITUTION) for obtaining a feedback signal from the piezoelectric actuator (22) while the piezoelectric actuator (22) operates; a processor (31) for using the feedback signal to determine the parameter of the piezoelectric actuator (22).

The device is a pump (10) and wherein the piezoelectric actuator (22) operates to pump fluid in the pump (10).

The controller (31) subsequently uses the parameter of the piezoelectric actuator (22) to control the drive signal to the piezoelectric actuator (22).

The drive circuit comprises: means for applying a drive signal to the piezoelectric actuator (22); means for obtaining a feedback signal (see CONSTITUTION) from the piezoelectric actuator (22) while the piezoelectric actuator (22) operates; means for using the feedback signal to determine a parameter (voltage) of the piezoelectric actuator (22).

Aoki shows (figs. 1, 6) a piezoelectrically-actuated device comprising: a piezoelectric actuator (22) which is responsive to a drive signal for pumping fluid between the inlet (12) and outlet (13); and a drive circuit (31) for sensing a parameter (see CONSTITUTION) of the piezoelectric actuator (22) and for adjusting a drive signal of the piezoelectric actuator (22) in accordance with the parameter.

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The device is a pump (10) having a pump body for at least partially defining a pumping chamber (between 12 and 13) having an inlet (12) and an outlet (13) which communicate with the pumping chamber, and wherein the piezoelectric actuator (22) pumps fluid between the inlet (12) and outlet (13).

Aoki doesn't note sensing the capacitance of the piezoelectric actuator.

It would have been obvious to one having ordinary skill in the art to sense a capacitance of the piezoelectric actuator in the device of Aoki at the time of his invention such as is taught by Raffalt et al. since the design of the circuit allows for a method that monitors the entire power circuit of the transducer device for interruptions without requiring additional lines or components on the actuator element itself as Raffalt et al. note in their paragraph 7.

Claims 6, 12, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Raffalt et al. (US 2002/0140441) in view of Jaenker (US 6,411,009). Given the invention of Raffalt et al. as noted above, they don't note use of their piezoelectric actuator to pump fluid in a pump.

Jaenker shows (fig. 3) a method for determining a parameter for a piezoelectric actuator (19, 20), the method comprising: applying a drive signal to the piezoelectric actuator (19, 20); operating the piezoelectric actuator (19, 20); obtaining a feedback signal (UL) from the piezoelectric actuator (19, 20); using the feedback signal to determine a parameter of the piezoelectric actuator (19, 20).



The method further comprising subsequently using the parameter of the piezoelectric actuator (19, 20) to control the drive signal to the piezoelectric actuator (19, 20).

The method further comprising subsequently using the parameter of the piezoelectric actuator (19, 20) to control pulse widths of a pulse width modulated signal (outputs of 25) from which the drive signal is derived.

Jaenker shows (fig. 3) a drive circuit for sensing a parameter of a piezoelectric actuator (19, 20) operating in a device and for adjusting a drive signal of the piezoelectric actuator (19, 20) in accordance with the parameter.

The drive circuit comprises a controller for controlling a drive signal applied to the piezoelectric actuator (19, 20); a feedback monitor for obtaining a feedback signal (UL) from the piezoelectric actuator (19, 20) while the piezoelectric actuator (19, 20) operates; a processor (26) for using the feedback signal to determine the parameter of the piezoelectric actuator.

The controller subsequently uses the parameter of the piezoelectric actuator (19, 20) to control the drive signal to the piezoelectric actuator (19, 20).

The controller subsequently uses the parameter of the piezoelectric actuator to control pulse widths of a pulse width modulated signal (outputs of 25) from which the drive signal is derived.

Jaenker doesn't note sensing the capacitance of the piezoelectric actuator.

It would have been obvious to one having ordinary skill in the art to sense a capacitance of the piezoelectric actuator in the device of Jaenker at the time of his

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invention such as is taught by Raffalt et al. since the design of the circuit allows for a method that monitors the entire power circuit of the transducer device for interruptions without requiring additional lines or components on the actuator element itself as Raffalt et al. note in their paragraph 7.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over in view Raffalt et al. (US 2002/0140441) and Jaenker (US 6,411,009) in view of Takagi et al. (US 2004/0018100). Given the combined invention of Takagi et al. and Raffalt et al. as noted above, they do not show that their controller subsequently uses the parameter of the piezoelectric actuator to control pulse widths of a pulse width modulated signal from which the drive signal is derived.

Given the invention of Jaenker as noted above, he does not show a pump.

It would have been obvious to one having ordinary skill in the art at the time of the combined invention of Takagi et al. and Raffalt et al. to employ a controller that uses a detected parameter to control pulse widths of a drive signal because the circuit employed saves energy as noted at col. 2, lines 35-43.

Claims 33 and 34 are is rejected under 35 U.S.C. 103(a) as being unpatentable over Raffalt et al. (US 2002/0140441) and Takagi et al. (US 2004/0018100) in view of Kitani (US 6,229,245). Given the combined invention of Raffalt et al. and Takagi et al. as noted above, they don't show their controller varying the drive signal through a range of excitation frequencies; and wherein the output monitor obtains a voltage value from the feedback signal for each of the excitation frequencies, and wherein the processor

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determines a resonant frequency of the piezoelectric actuator as corresponding to a frequency in the range that had a minimum voltage value from the feedback signal.

Given the invention of Kitani as noted above, they don't show a pump.

It would have been obvious to employ the pump structure of the combined invention of Raffalt et al. and Takagi et al. in the invention of Kitani so that the Kitani device could do useful work.

***Allowable Subject Matter***

Claims 9, 10, 20, 21, 25, 35 and 36 are allowed.

Claims 3, 4, 14, 15, 23, 29 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator driving a pump controlling the drive signal so that an ascertainable electrical charge is applied to the piezoelectric actuator; obtaining a voltage value from the feedback signal; using the electrical charge and the voltage value from the feedback signal to determine capacitance of the piezoelectric actuator; the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator driving a pump varying the drive signal, monitoring the feedback signal as the drive signal is varied for an "echo"; determining a resonant frequency of the piezoelectric actuator as an inverse of a period of the echo; the prior art fails to suggest parameter determination in a piezoelectric actuator or a piezoelectric actuator

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driving a pump the controller controls the drive signal so that an ascertainable electrical charge is applied to the piezoelectric actuator; wherein the feedback monitor obtains a voltage value from the feedback signal; and wherein the processor uses the electrical charge and the voltage value from the feedback signal to determine capacitance of the piezoelectric actuator.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The remaining prior art cited reads on at least some aspects of the claimed invention.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Direct inquiry to Examiner Dougherty at (571) 272-2022.

*tmd*  
tmd

May 2, 2006

*Thomas M. Dougherty*  
**TOM DOUGHERTY**  
**PRIMARY EXAMINER**